eg. Cindy is going to Alpha Centauri , 4.5 light years away, at 0.99c.

a) what is gamma?
= 7.09

b) how long does the trip to the star take in Cindy's frame
the distance to Alpha Centauri is Lorentz contracted by
$L=L_o/\gamma$ = 4.5/7.09=0.6347 light years
t=d/v = 0.6347/0.99=0.6411 years
= 0.64years

ii)Amy (stays on Earth)'s frame

t=d/v = 4.5light years/0.99xspeed of light
= 4.5/0.99=4.5455 years

c) What time is it on Earth in Cindy's frame before/after the turn around. (tricky)
$t'=\gamma(t-vx/c^2)$
t'= 7.09x(0.6411-(0.99x0.6347))=0.0904 years
7.09x(0.6411+(0.99x0.6347))=9.0004 years
so, before the tunaround, Cindy sees time on Earth as going slower, on 0.09 years while she experiences 0.64years.
After she turns around, she "sees" time on Earth as being 9.0 years. So when she gets back to

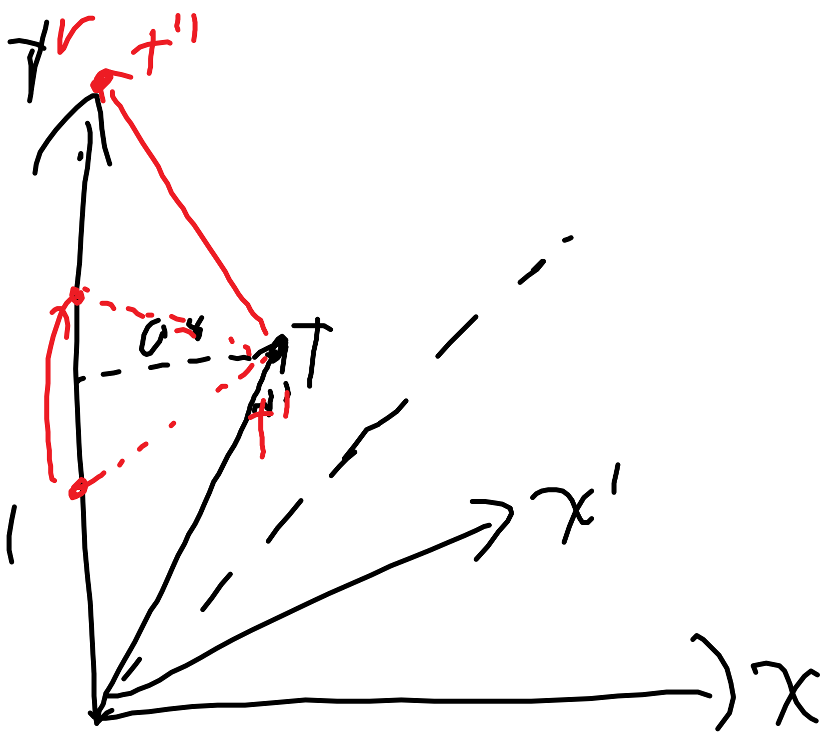
Earth, she has only experienced 2x0.6411=1.2822 years while Amy experiences 9.0004 +(0.6411/7.09)=9.0908 years.
4.5455x2=9.091 alternately

d) When Cindy gets back, how much younger is she than Amy?
9.0004-1.2822=7.7182 years younger

e) What distance was covered in Cindy's frame?
$L=L_o/\gamma$ = 4.5/7.09=0.6347 light years
0.6347x2=1.2694 light years

Homework - look over the exam style questions.

Q3, 4, 6 (8 is HL only)



a) Two twins, one travels near c away and

back. Each twin sees the other's clock running slow. How can both times be slower?

b) Resolved because

i) the travelling twin's sees the distance length contracted, so it takes them less time, so they come back younger.

ii) when the twin turns around, they shift spacetimes, so the time on Earth shifts according to

$t'=\gamma(t-vx/c^2)$

as v changes from + to -, t' changes dramatically - so time on Earth changes in the frame of the travelling twin

c) i - t=d/v = 12light years/0.80c 12/0.8=15 years

ii) Lorentz contracted

$$\gamma = \frac{1}{\sqrt{1-\frac{(0.80c)^2}{c^2}}} = \frac{1}{\sqrt{1-\frac{0.64c^2}{c^2}}}$$

$$\frac{1}{\sqrt{0.36}} = \frac{1}{0.6} = \frac{5}{3}$$

$$\gamma = 1.666\ldots$$

$\gamma = 1.666...$

12/1.6666667=7.1999999

7.199999/0.8=8.999999 =9.0years

iii) A

$t' = \gamma(t - vx/c^2)$ = 1.66667x(8.999-(0.8x7.1999))=5.39848 years

iv 1.66667x(8.999+(0.8x7.1999))=24.59825 years

v) 30 years (15x2)

vi) 18years (9x2)

d earth twin aged 30 years, the travelling twin aged 18 years.

You send a signal down a cable with 3.0×10^{-3} W/m^2 of intensity. 2.0 km along the cable, the signal has dropped to 2.0×10^{-3} W/m^2. What is the attenuation per unit distance?

attenuation = 10Log I/I_o

attenuation = 10xLog(2/3)=-4.054651081081644 -4.05465

1081081644

attenuation/d = -4.05463/2=-2.02731 dB/km

What would be the signal left after another 5.0km with no boost?

-2.02731 dB/km x 5.0km
-2.02731x5=-10.13655 dB
attenuation = $10Log(I/I_o)$

-10.13655 = $-10Log(I/2.0x10^{-3}W/m^2)$
-10.13655/10=-1.01365
10^(-1.01365)=0.09691 = $(I/2.0x10^{-3}W/m^2)$
i = 0.09691X2=0.19382
$1.9X10^{-4}W/m^2$